

9/23 Overview

1. Discuss quiz / solutions
2. Mira activities – wrap-up
3. Theoretical origami – wrap-up
  - a. Note about “copying an angle” (#10)
  - b. Note about trisecting an angle (e.g. #26-27)
4. Section 3.4 - Star Polygons  
HW: Sec. 3.4 #5-15

Looking ahead:

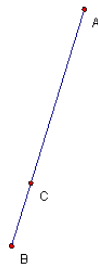
- \* Exam 1 is next Tuesday.
- \* We'll split Thursday between "Flatland" and reviewing.

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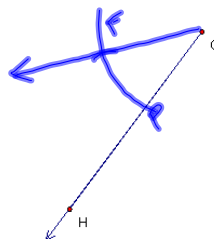
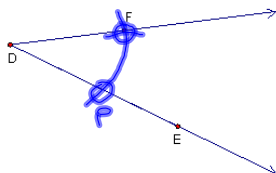
Mthl 71 Quiz 1 – Ruler & Compass  
Fall 2008

Name: \_\_\_\_\_

1. Show how to construct a line that is perpendicular to segment  $AB$  and passes through  $C$ . *Leave all necessary construction marks.*

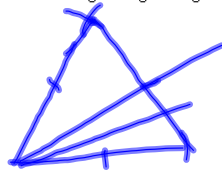


2. Show how to use a ruler and compass to copy angle  $FDE$  onto ray  $GH$ . *Leave all necessary construction marks.*



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3. Show how you could construct a 15 degree angle using a straightedge and compass. Briefly explain your procedure.

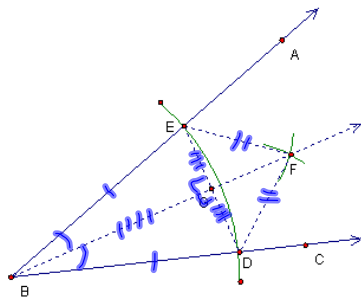


4. Sketch line segment AB and divide it into two pieces AC and CB so that your division *approximately* exhibits the golden ratio. Label your diagram and state the proportion that must be true if indeed you have divided it according to the golden ratio.



5. The construction below shows how to bisect angle ABC using ruler and compass techniques. Write a convincing argument why, based on this construction, angle ABC has in fact been bisected. (Hint: Use triangle congruency theorems to argue why angle ABF is congruent to angle CBF.)

You may use (without proof) the fact that line GF is the perpendicular bisector of segment ED. *Please be precise in your notation.*



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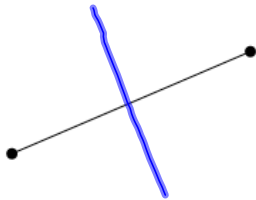
Mth171 – Mira Introduction

Name: \_\_\_\_\_

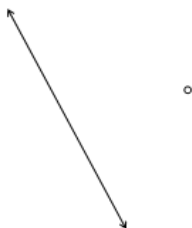
Use a Mira, to perform the indicated constructions. Remember the following bits of advice about using the Mira.

- Always have the beveled side down and facing you, and trace along that side.
- Rotate your paper so the Mira is perpendicular to your body for best results.
- Reflections of objects very near the Mira's edge can be distorted, so try to avoid that if possible.

1. Construct a perpendicular bisector to the segment.

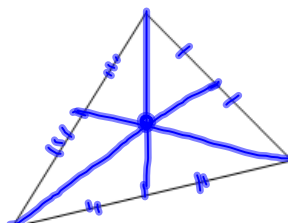
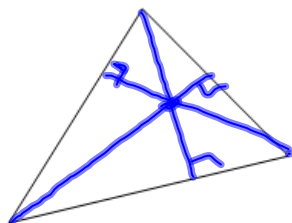


2. Construct a perpendicular bisector to the line that passes through the point not on the line.



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3. Construct the **altitudes** and **medians** of the triangles. (Be precise: it will pay off in the end.)

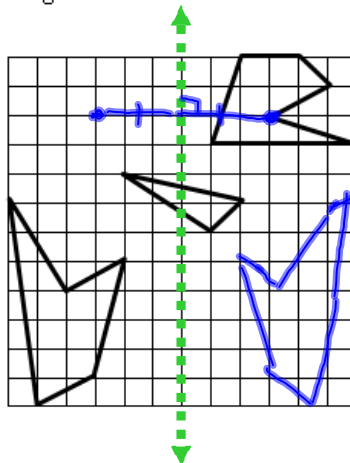


Facts from geometry:

1. The three altitudes of a triangle coincide at a single point called the orthocenter.
2. The three medians of a triangle coincide at a single point called the centroid.

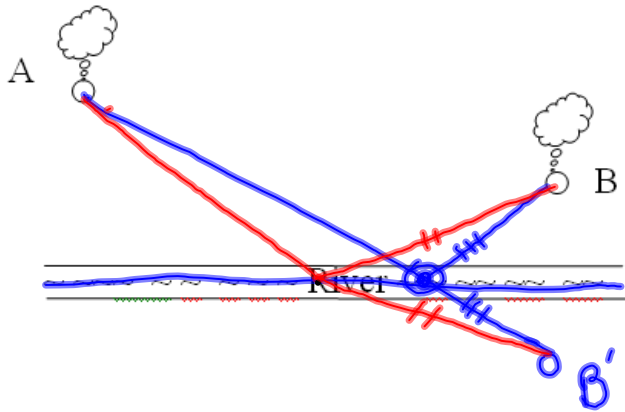
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4. Without using a Mira, sketch the reflection images of the figures shown. Use a Mira to check your answer.



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5. A helicopter for a forest fire fighting unit must take turns replenishing the water supply for firefighters at two different fires. The fires are located at points A and B on the same side of the river, as shown. What point on the river should the helicopter aim for in order to minimize the distance traveled while refueling the two teams? (Hint: the shortest path between two points is a straight line...)



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### Theoretical Origami - Closure (?)

Exercise 10 asks you to devise a method for copying an angle using paper folding.

- How can this be done?

(This would make a nice portfolio entry)

Exercise 26-27 are related to "trisecting an angle" using origami. This *not* possible using straightedge & compass alone.

- The proof that the angle has indeed been trisected is included on p. 70.
- An expanded write-up of this construction and proof, with additional illustration & discussion, would also make a nice portfolio entry.

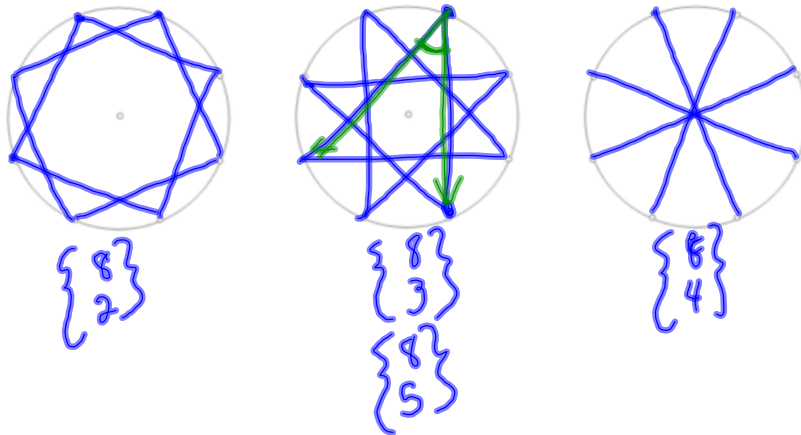
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## Star Polygons

A regular  $n$ -sided polygon can be drawn by locating  $n$  equally spaced points around a circle and connecting them in order.

We can also form other figures, such as by connecting every other point, every third point, etc.

What happens if you connect every 2nd dot below? Every 3rd dot? Every 4th dot? 5th? 6th? 7th?



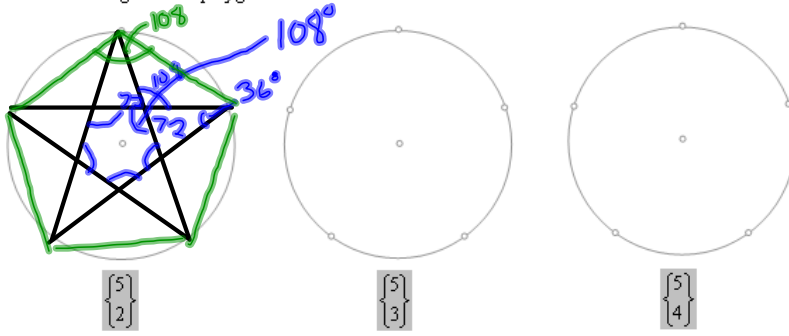
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A Regular Star Polygon is formed if the resulting figure connects every point in a single path.

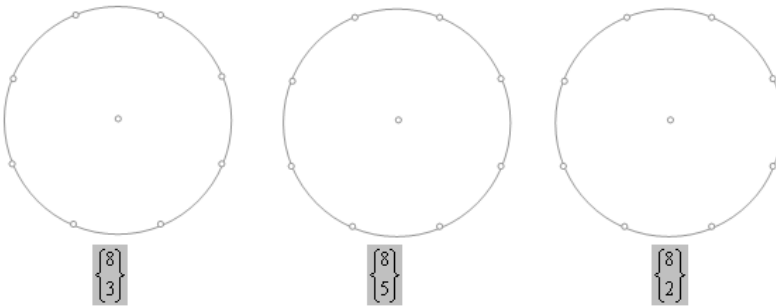
Notation:  $\{n,k\}$  refers to the star polygon formed by connecting every  $k$ th dot of  $n$  regularly spaced points around a circle.

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Sketch the regular star polygons denoted below.

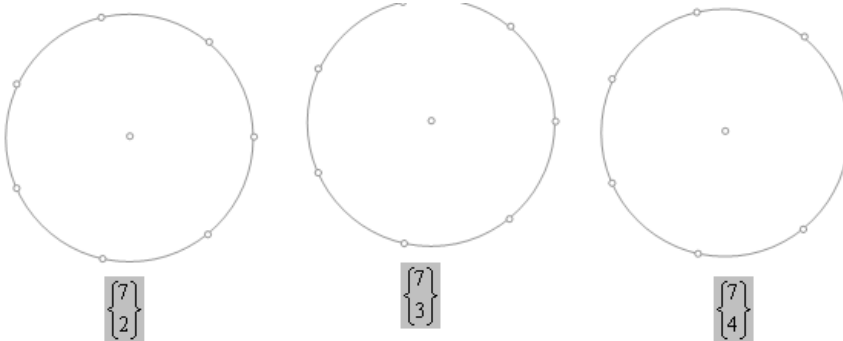


What is the measure of the "vertex angle" of a  $\{5,2\}$  star polygon?



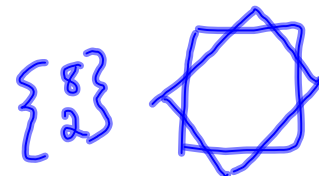
What is the measure of the "vertex angle" of an  $\{8,3\}$  star polygon?

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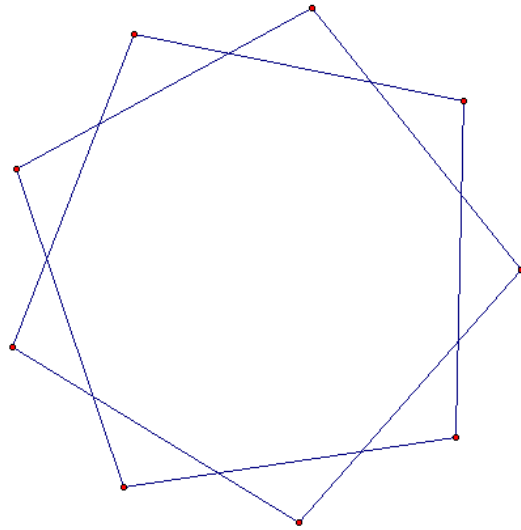
A Compound Star Polygon is formed if the resulting figure has more than one cycle.

Give an example of a compound star polygon.



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Work in groups to complete exercises 5-15 from Sec. 3.4.



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